

REMARKS/ARGUMENTS

Reconsideration of the application is requested.

Claims 1 and 6-7, and 9-10 remain in the application. Claim 1 has been amended. Claims 2-5, 8, and 11-12 have been cancelled.

In the section entitled "Specification" on page 4 of the above-identified Office action, the specification has been objected to because of informalities. Appropriate correction has been made.

In the section entitled "Claim Objections" on page 4 of the above-identified Office action, claims 1 and 12 have been objected to because of informalities. Appropriate correction has been made to claim 1. Claim 12 has been cancelled.

In the section entitled "Claim Rejections - 35 USC § 112" on pages 5-6 of the above-identified Office action, claims 1 and 3-12 have been rejected under 35 U.S.C. § 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is

most nearly connected, to make and/or use the invention, and under 35 U.S.C. § 112, second paragraph as being indefinite.

More specifically, the Examiner has stated that the critical charge density Q_c is not linked to a maximum local electric field and the phrase "the critical breakdown charge, denotes a critical value of the charge quantity Q at which the electrical breakdown is reached" is indefinite.

The recitation of the critical charge density Q_c and the phrase "the critical breakdown charge, denotes a critical value of the charge quantity Q at which the electrical breakdown is reached" have been deleted from the claims.

It is accordingly believed that the claims meet the requirements of 35 U.S.C. § 112, first and second paragraphs. Should the Examiner find any further objectionable items, counsel would appreciate a telephone call during which the matter may be resolved. The above-noted changes to the claims are provided solely for cosmetic and/or clarificatory reasons. The changes are neither provided for overcoming the prior art nor do they narrow the scope of the claims for any reason related to the statutory requirements for a patent.

In the section entitled "Claim Rejections - 35 USC § 103" on pages 6-13 of the above-mentioned Office action, claim 1 has been rejected as being unpatentable over Laska et al. ("A 2000 V-Non-Punch-Through-IGBT with Dynamical Properties like a 1000 V-IGBT", Int. Electron Dev. Mtg., New York, 1990 IEEE, pp.807-810) under 35 U.S.C. § 103(a); claim 3 has been rejected as being unpatentable over Laska et al. in view of Hutchings et al. (US Pat. No. 5,387,528) under 35 U.S.C. § 103(a); claims 1 and 3-5 have been rejected as being unpatentable over Park (US Pat. No. 5,702,961) in view of Laska et al. under 35 U.S.C. § 103(a); claim 6 has been rejected as being unpatentable over Park and Laska et al. and further in view of Fruth et al. (US Pat. No. 6,011,280) under 35 U.S.C. § 103(a); claim 7 has been rejected as being unpatentable over Park, Laska et al. and Fruth et al. and further in view of Feiler (US Pat. No. 6,236,068 B1) under 35 U.S.C. § 103(a).

The rejections have been noted and claim 1 has been amended in an effort to even more clearly define the invention of the instant application. More specifically, the features of claims 3-5 and 8 have been added to claim 1.

Before discussing the prior art in detail, it is believed that a brief review of the invention as claimed, would be helpful.

Claim 1 calls for, inter alia:

heavily doped terminal regions of said first conductivity type disposed at said second main surface;

a further zone of said first conductivity type disposed in a vicinity of said second main surface; and

punch-through regions disposed between said heavily doped terminal regions, a current/voltage characteristic in breakdown being controlled through an area ratio between said heavily doped terminal regions and said punch-through regions.

Since amended claim 1 has incorporated the features of claims 3-5, which have only been rejected as unpatentable over Park in view Laska et al., the following discussion is directed only to these two references.

Park shows in Fig. 1 an integrated power semiconductor device with IGBT cells and diode cells, which are located antiparallel to each other. The diode cells are formed of a p-doped region 106, an n⁻-doped semiconductor body 104 and an n⁺-doped region 116, 100. The IGBT cells have n⁺-doped regions 110 as source, p-doped regions 108 as collector, the n⁻-doped semiconductor body 104, the n⁺-doped region 116 as well as the p⁺-doped region 102 as emitter. The regions 100, 102 of a diode cell and an IGBT cell are short-circuited through a metalization 112. The same is true for a metalization 114 with regard to the p-doped region 106 of the diode cell and the regions 108, 110 of the IGBT cell.

In contrast, in the power semiconductor component according to the invention of the instant application the backside is so constructed that n⁺-doped terminal regions 9 are disposed in an n-doped layer 10, which is deposited in the n⁻-doped semiconductor body 1.

In Park the regions 100 and 102 belong to different components or cells, namely the region 100 belongs to the diode cell and the region 102 belongs to IGBT cell. This kind of division to differently structured cells is not present in the backside structure according to the invention of the instant application. Rather, according to the invention of the instant application the n⁺-doped terminal regions 9 are disposed in an n-doped layer 10, which is deposited in the n⁻-doped semiconductor body 1. Especially, in the invention of the instant application there are no p⁺-doped regions - corresponding to the regions 102 in Park - in the layer 100.

If a person skilled in the art would transfer the teaching of Park to the prior art according to Laska et al., he or she would abandon the p-doped region of the backside (see especially Fig. 1), when no IGBT should be formed, and apply an n⁺-doped layer on the n⁻-doped semiconductor body according to the teaching of Park. If an IGBT should be formed, then he or she would apply a continuous p⁺-doped layer to replace the

p-doped layer. Either way, the backside of the semiconductor component corresponding to Fig. 1 of Park would have a p⁺-doped layer (102) or an n⁺-doped layer (100). This, however, does not lead to the backside structure according to the invention of the instant application (see Fig. 2). The advantages of the backside structure according to the invention of the instant application are described on page 13, lines 6-12 and page 19, line 14 to page 20, line 2 of the specification.

It is accordingly believed to be clear that none of the references, whether taken alone or in any combination, either show or suggest the features of claim 1. Claim 1 is, therefore, believed to be patentable over the art and since all of the dependent claims are ultimately dependent on claim 1, they are believed to be patentable as well.

In view of the foregoing, reconsideration and allowance of claims 1 and 6-7, and 9-10 are solicited.

In the event the Examiner should still find any of the claims to be unpatentable, counsel would appreciate a telephone call so that, if possible, patentable language can be worked out. In the alternative, the entry of the amendment is requested as it is believed to place the application in better condition

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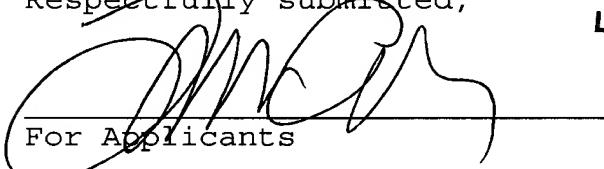
for appeal, without requiring extension of the field of search.

IT IS NOTED THAT THE ENTRY OF SUBJECT MATTER FROM CLAIMS 3-5 AND 8 INTO CLAIM 1 CANNOT, BY DEFINITION, RAISE NEW ISSUE OR REQUIRE A NEW SEARCH, SINCE THAT SUBJECT MATTER HAS ALREADY BEEN CONSIDERED BY THE EXAMINER.

Petition for extension is herewith made. The extension fee for response within a period of one month pursuant to Section 1.136(a) in the amount of \$110.00 in accordance with Section 1.17 is enclosed herewith. Please charge any other fees which might be due with respect to Sections 1.16 and 1.17 to the Deposit Account of Lerner and Greenberg, P.A., No. 12-1099.

Respectfully submitted,

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For Applicants

YC:cgm

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